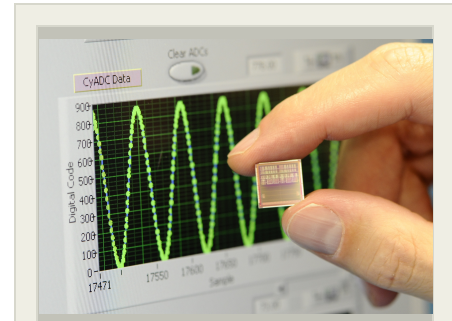## Project Introduction

This projects seeks to continue the development of the Radiation Hardened Housekeeping Slave Node (RH-HKSN) ASIC. The effort has taken parallel paths by implementing the concept as (1) a custom ASIC re-using robust in-house rad-hard IP in a low-cost CMOS process and also (2) in a new rad-hard mixed-signal structured ASIC developed by TRIAD Semiconductor. The device will serve as NASA's low-power data acquisition system-on-a-chip suitable for miniaturized instruments, CubeSats and spacecraft housekeeping data collection. It will operate as a remote terminal unit (RTU) for standalone housekeeping/telemetry collection. A first version will contain a 16 channel analog multiplexer (expandable to 32 externally) and will be able to measure platinum resistance thermistors (PRTs), total ionizing dose radiation (using external RadFETs) and voltages. It will have useful circuits such as high resolution digital-to-analog converters, bandgap references and programmable general purpose I/O. The device will implement multiple serial interfaces including Serial-to-Parallel Interface (SPI) and I^{2}C. The device will improve efficiency by reducing the size of instrument and spacecraft housekeeping electronics by up to 25-30% by combining analog, digital and mixed-signal functions on a single radiation hardened silicon die with serial interfaces to reduce the number of wires. It also reduces mass, volume, power and potentially reduce cost/time by replacing portions C&DH FPGA development.

Anticipated Benefits

Part of this this work is in collaboration with AFRL and TRIAD Semiconductor; and will expand the capabilities and performance of their space worthy mixed-signal structured ASIC technology which will greatly benefit NASA instrument miniaturization efforts and other national efforts.

The collaboration will expand the capabilities and performance of space worthy mixed-signal structured ASIC technology which will greatly benefit NASA instrument miniaturization efforts and other national efforts.

Radiation Hardened Mixed-Signal ASIC
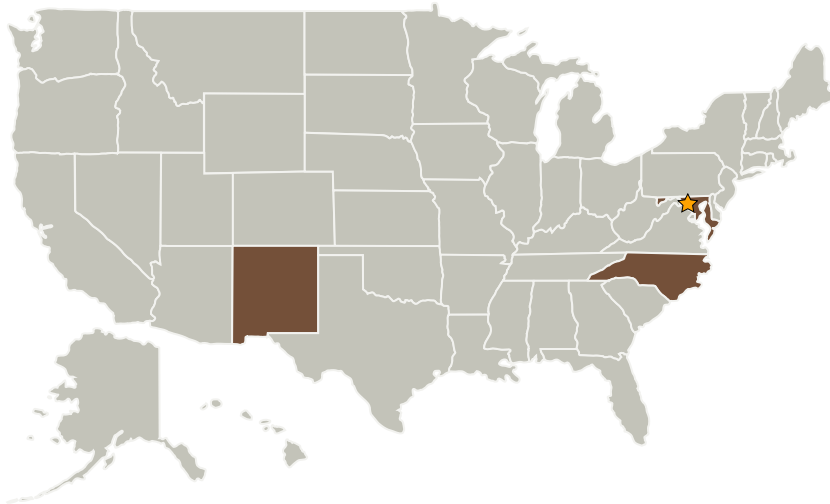
Table of Contents

Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
⭐Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Co-Funding Partners	Type	Location
Air Force Research Laboratory(AFRL)	US Government	Notre Dame, Indiana
Triad Semiconductor(TRIAD)	Industry	Winston-Salem, North Carolina

Primary U.S. Work Locations	
Maryland	New Mexico
North Carolina	

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

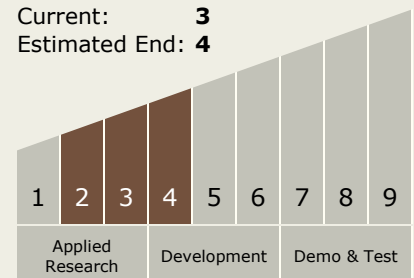Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

Wesley A Powell
Michael A Johnson

Principal Investigator:
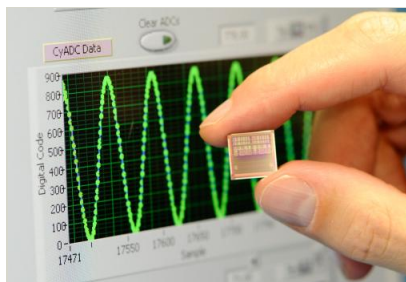
George Suarez Martinez

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **4**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		

Tech Port

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For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/17385

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Images

Structured ASIC
Radiation Hardened Mixed-Signal ASIC
(https://techport.nasa.gov/image/4138)

Links

GSC-1645-1
(no url provided)

GSC-16989-1
(no url provided)

Project Website:

http://aetd.gsfc.nasa.gov

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  └ TX02.1 Avionics Component Technologies
    └ TX02.1.6 Radiation Hardened ASIC Technologies

Target Destinations

Earth, Others Inside the Solar System, Outside the Solar System